

HISTORICAL AND BIBLIOGRAPHICAL NOTES.

A SERIES OF SKETCHES OF THE LIVES, TIMES AND WORKS OF THE OLD
MASTERS OF ANATOMY AND SURGERY.

By GEORGE JACKSON FISHER, M.D.

XXI. ABÛL-CÂSEM CHALAF EBN-ABBAS AL-
ZAHARAVI, COMMONLY CALLED ALBUCASIS.

1060—1122.



ALBUCASIS was a Spanish Moor, and is said to have been born at Al Zahra, or Zahera, in the vicinity of Cordova, in Spain, but in what year we are not credibly informed. Friend (*Hist. of Physic*, Pt. II., p. 128), says he finds "no certainty of this author's age, but he is generally (though for what reason I do not apprehend), supposed to have lived about the year 1085." Moir (*Outlines of the Ancient Hist. of Med.*, p. 258), declares that "Casiri has proved, from incontestable evidence, that, at all events, he died in 1122." Haller places him in 1080, and Eloy in 1085. Choulant quotes two widely different dates for the year of Albucasis' death, one being 1013, the other

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1106. The period is probably very uncertain, and it is altogether needless to attempt to reconcile the discrepancies of learned writers on this point.

A very curious bit of confusion also exists among medical historiographers as to the identity of two names not unfrequently met with, viz.: Albucasis and Alzaharavius. Friend maintains that they represent one and the same individual. Perhaps the most satisfactory thing to do is to transcribe Friend's own account of his mode of arriving at the conclusion, that the two names belong to the same author. In speaking of Alzaharavius, he says, "In perusing this author, I observed that he refers to a book, which contained the Precepts and Practice of Surgery: this he does very often, particularly p. 80 to 127 (13 times), I compared these passages with Albucasis, as he is commonly called, the only Arabian who has left us any separate treatise of chirurgical operations; and I had the satisfaction to see, that every case in surgery, as mentioned by Alzaharavius, was treated of by him. I desired the favour of Mr. Gagnier, who has very great skill in the Oriental languages, to enquire whether the Arabic original of Albucasis could be found in the Bodleian Library. Upon searching, he met with one Manuscript in Archbishop Marsh's collection, No. 54, with this title (translated into Latin thus): *Tractatus x libri Zaharavi dictus operatio manus (i. e.), Chirurgia and ars medica*, etc.—but not finding the name of Albucasis (which is the name given him in a Latin M.S. there by Gerardus Carmonensis, who translated him), he went further, and found another M.S. amongst Dr. Huntington's, No. 156, with this title at large—*Pars xi libri Al-Tasrif, Authore Ablû-câsem Chalaf Ebn-Abbas Al-Zaharavi*—and at the end of the M.S. were these words translated out of Arabic thus, *Explicit hîc Tractatus de Chirurgia estque conclusio totius libri Practices medicinæ cujus Author est Ab'ul-casem, etc. Die*

primo mensis Safar, A. H. 807, and in the Latin M.S. already mentioned of Gerardus, it is called *particula 30 libri Albucaism*. The joint authority of these two MSS. concurring with what I have observed before, about the references to a treatise of Surgery, puts it, I think, beyond all dispute, that what we have now under the name of Alzharavius and Albucasis were writ by the same person. Add to this, that Albucasis often refers to a book, which he had writ concerning the Practice of Physic." (Op. cit. p. 126-128). Moir dissents from the above opinion of Friend, and believes that they are two distinct writers, Albucasis being a celebrated and quite an original author on Surgery, while Alzharavius was a merely servile copyist from the writings of Rhazes, and Albucasis. The learned Dr. Ludwig Choulant (*Handbuch der Bücherkunde für die Ältere Medicin*, Leipzig, 1841, p. 372). Renouard (*Hist. of Med.*, p. 264), and others, accept the two names as designating the same author. This seems to be the most sensible view to take of the matter, and quite evident when we observe the name of the place of nativity which all writers assign to Albucasis, viz :—Al-Zahera—which when Latinized was rendered Alzharavius.

The name of this author will be found variously modified, and in some instances almost unrecognizable, as we meet it in medical literature. The original names of Arabic medical writers have undergone remarkable metamorphoses by translation into mongrel Spanish, barbarous Latin, and ever-varying English. In this instance we find Albucasis, Albucaim, Abulcasis, Albucazi, Abul-Kasem, Bulchasin, Bucasis, Casa, Alzharavius, Alzharavius, Al-Zaharavius, Alzahrawi, and Benaberazerim.

Of his personality and private history, unfortunately, no particulars have been handed down to us, with the

exception, that he was a high-minded practitioner, to whom the love of pecuniary gain was a minor consideration, who possessed a dignified, liberal, and disinterested spirit, and gained the respect, gratitude, and love of his countrymen. And now that nine centuries have rolled away, he is regarded as the most celebrated and eminent Arabian surgical writers, of any whose works have survived the wasting influences of time.

The "Al-Tasrif," or the Art of Healing, of Alzaravius, was little more than an abridgment of the theory and practice of Medicine as understood in that day, and though not devoid of merit, being in advance of all similar works in systematic and methodical arrangement, it must, however, be admitted that it was largely made up of extensive transcripts from Rhazes and others of his predecessors, as well as from the Greeks, Hippocrates, and Galen, Ætius, and Paulus Ægineta, although he fails to mention the names of any except the two former. What appears quite strange is the fact that Alzaravius is entirely unmentioned by any of the Arabian medical writers.

It is with the *Chirurgia* of Albucasis that we are most interested, and with the perusal of which we are most amply repaid. This is a work of great value. Fabricius ab Aquapendente esteemed this work very highly, saying, "Celsus among the Latins, Paulus Ægineta among the Greeks, and Albucasis among the Arabians, form a triumvirate to which I confess I am under great obligations."

Avenzoar and Albucasis bear concurrent testimony to the almost extinction of surgery at the time they entered upon their career. Albucasis gives the following reasons for having written his work on surgery :

"After having terminated, happily enough, the work on Medicine which I undertook for your instruction, my sons, I have thought it proper to add to it a small treatise on

manual operations, seeing that this part of our science is so much neglected in our country at the present time, that there remains scarcely any vestiges of it. We can only find a few short descriptions of operations in the books of the ancients; they are, however, disfigured by the ignorance of the bookmakers; the manuscripts are so faulty, that at every step we are in such doubt as to the sense of the authors, that no one dare enter into the study of surgery. I have, therefore undertaken this little treatise for the purpose of reviving this most important and useful branch of our Art. I have detailed briefly the methods of operation, I have described all the necessary instruments, and I present their forms, by means of drawings; in a word, I have omitted nothing of what can shed light on the practice. But one of the principal reasons why it is so rare to meet a skillful surgeon is, that the apprenticeship to this branch is very long, and he that devotes himself to it must be versed in the science of anatomy, of which Galen has transmitted us the knowledge. He should know the functions of organs, their shape, and their relations; the number of the bones, and their modes of union; the origin and termination of the muscles, the nerves, the arteries, and the veins. In fine, no one should permit himself to attempt this difficult art without having a perfect knowledge of anatomy, and the action of remedies" (lib. I.).

It will be observed that Albucasis, who places so high an estimate on the value and necessity of an exact knowledge of anatomy to the surgeon, is everywhere silent on the subject of dissection, and only points to the works of Galen as the repository of this science.

His treatise on Surgery is divided into three books. The first comprehends everything relating to the multiple uses of the cautery, a favorite remedial agent among the Arabians, in all its forms—actual and potential—the modes of

application, the various instruments and escharotics to be employed, the requisite cautions, and much detail. He enumerates fifty diseases in which he had observed their utility. The second book comprises all that relates to operations to be performed by the use of cutting instruments. He describes numerous instruments which may be seen figured in both of the Bodleian MSS., as well as in most of the Latin editions of his works. He also gives directions for many surgical operations, ranging from the simplest to the most formidable. He describes ninety-seven operations performed with the knife, several of which will be mentioned farther on. The third book is devoted to the treatment of fractures and dislocations of the bones. He tells us that this branch of surgery had unhappily fallen into the hands of the most ignorant, vulgar and impudent pretenders, and was looked upon with contempt and suspicion.

Albucasis assures us that his work is founded upon extensive reading and large personal experience, and that he had written nothing that he had not witnessed in his own practice; and yet the work is little more than a fair exposition and epitome of the principles and practice of Arabian surgery as taught by his predecessors. There is no other work of this period, however, that is at all comparable with this in general completeness, richness of detail, and lucidity in description. It is of especial interest and value in that it is the first surgical work that has furnished the moderns with figures of the ancient surgical instruments, already alluded to, as well as careful descriptions of the same. Indeed, it may truly be esteemed as one of the most precious relics of the healing art which has been transmitted to us from mediæval times.

In presenting a brief analysis of the surgical views and practice of the Arabians as we find them set forth in the writings of Albucasis, I will begin with his first book relating to the use of the cautery.

Albucasis, in common with all the Arabian surgeons, was particularly partial to the actual cautery. Friend says, "he seems to be in a rapture in speaking of the divine and secret virtues of fire." Even ages before, Dioscorides, the contemporary of Celsus, spoke of the use of the actual cautery as the "Arabian burnings." We find Albucasis using it extensively and with great success as he claims in obstinate cases of Sciatica.

Albucasis mentions four modes of curing trichiasis.

1. By the actual cautery.
2. By the potential cautery.
3. By incision and suture, which operation he describes with minute detail, much after the mode of Paulus Ægineta.
4. By making an incision the whole length of the lid, within the ciliary hairs, and twisting the redundant skin firmly about reeds or small pieces of wood until it mortifies, then curing the wound as any other. He describes many other operations belonging to ophthalmic surgery; such as eversion of the eyelids, lipoma of the lids, adhesion of the eyelids, encanthis, pterygia, staphyloma, hypopyon, fistula lachrymalis, and cataract.

In cases of abscess resulting from obstruction of the lachrymal duct, he directs us to open the abscess freely, so as to make an outlet for the pus, and expose the bone. If it is found to be diseased, he recommends us to scrape it with an iron instrument, and then to apply styptic and desiccative medicines to it. When this treatment fails, he directs us to perforate the bone with a triangular instrument of iron. When air issues from the nose by the opening we know, he says, that the operation is completed.

In operations for cataract by depression, Albucasis describes the process of Paulus Ægineta with great minuteness of detail, and gives drawings of the couching-needles, called by him *almagda*. The instrument is to be passed down into the eye to as great a space as the pupil of the

eye is distant from the end of the black part called the cornea. He says nothing of tearing the cataract into pieces when it proves difficult to depress. He mentions that he had heard of a certain oculist who, it was said, sucked out the cataract (lens) through a small tube. He adds, however, that he had never seen any person who had performed this mode of operation, nor had he read about it in the works of the ancients. (*Chirurg. ii., 23.*) Rhazes accurately describes the operations of couching, extracting, and sucking out the cataract. (*ad Mansor, ix., 27, and Cont. ii.*) Our author gives judicious directions for treating imperforate meatus auditorius; and also for the removal of foreign bodies from the same passage. For the extraction of a piece of stone he recommends us, among other means, to use a slender forceps, of which he gives a drawing. It resembles the ordinary dissecting forceps now in use. He also gives a drawing of a hook slightly bent, which he commends; and also of a brazen tube to be used for sucking out foreign bodies from the ear. When other means do not succeed, he directs us to make an incision at the upper part of the ear, having previously let blood in order to avert inflammation and convulsions. Insects are to be sucked out with a tube narrow below and wider externally, or they are to be extracted with a forceps or hook. When these means do not succeed, an oil, to which some substance destructive to these animals has been added, is to be injected with an instrument, of which he also furnishes a drawing.

Albucasis minutely describes the operation of excision and also of sawing out fibrous polypi from the nasal cavities. In the former case he directs us to seize the tumor with a hook, to pull it down, and cut it out. If any part remain he recommends us to scrape it out with a slender instrument, and then to apply styptics, such as vinegar, water, or snow. The operation of sawing it out with a

thread moderately thick, like a cord, tied in knots at short distances, is fully described by him. He also speaks of cauterizing the part from which the tumor was removed. Epulis, a soft, fleshy excrescence which forms upon the gums, was treated by Albucasis by excision with forceps and scalpel, after which styptics are to be applied to the part, and if the tumor should grow again, the actual cautery, knob-shaped, must be resorted to. (Chirurg. i, 22, and ii, 28.) The same treatment is advised by modern surgeons.

Of all the ancient surgical writers Albucasis has treated the subject of operations upon the teeth with the greatest fullness and care. He directs that free scarification of the gums be made before performing extraction, and then pulling the tooth direct with forceps, the patient's head being meantime held between the knees of the operator. (The writer of this sketch has vivid and painful recollections of submitting to this mode of vice-like retention of the head, while a rural Arab-of-a-doctor wrenched a molar from his inferior maxillary with a cant-hook, known to many still living, as a turn-key. This heroic method is not yet entirely obsolete.) Albucasis directs that hollow teeth be stuffed with a tent of cloth before applying the forceps. If a piece of the alveolar process be broken, he advises its removal. He also gives directions for filing projecting points or diseased portions of teeth. When teeth have been loosened by accident, he directs that they shall be secured by threads or wires of gold. In his second book, thirtieth chapter, he gives drawings of instruments for the extraction of roots of teeth.

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ALBUCASIS operated upon tongue-tie in the same manner as it is now done by modern surgeons. He gives particular cautions against opening the artery below the tongue, on account of hæmorrhage. Should the accident occur, he advises the prompt use of the actual cautery

(Ch. ii., 34). In cases of enlarged and indurated tonsils he removes them by incision. The patient is to sit with his head on the operator's bosom, and while an assistant depresses his tongue, the operator seizes the tonsil with a tenaculum, draws it out, and cuts it off with a sharp instrument resembling a forceps, or in other words a pair of scissors. He likewise gives a drawing of another instrument, which consists of a lunated piece of iron fixed in a handle; the primitive form from which the moderns have evolved the tonsil-

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lotome. He relates an interesting case in which he performed this operation (Ch. ii., 36). Guido de Cauliaco copies the description of Albucasis.

Albucasis gives directions for truncating the uvula by incision, and also gives a drawing of an instrument for operating with caustic medicines (Ch. ii., 37).

He directs the removal of fish-bones, and other substances which may be lodged in the pharynx, by the forceps, and in case of failure to introduce an instrument made of lead, of which he gives a drawing, and either to extract the substance or push it downwards. When a morsel of food sticks in the œsophagus, he directs that the person be struck on the back to facilitate its descent. This time-honored proceeding, courteous reader, you observe, has the sanction of eight centuries, and when again you hammer a strangling friend, or are yourself hammered on the back, under like conditions to produce reflex-excito-motor-pharyngo-œsophageal-peristaltic-back-action, please do not forget the old Arab Alsaharavius, vel Albucasis, alias Bulcasim, etc., etc.

Our author copies from Paulus Ægineta his description of the operation of Laryngotomy. He probably never performed it or ever saw it done. He declares that wounds of the windpipe are not extremely dangerous or fatal, and demonstrates it by the narration of the case of a female, who, in attempting suicide, cut her trachea, in which case, by sewing up the wound, he effected a cure without difficulty (Ch. ii., 13).

Albucasis directs the excision of large adenoid tumors, and when there is a large blood vessel at the bottom of the tumor to apply a ligature round its root, and allow it to drop out by putrefaction. In some cases he used the red-hot iron. If the tumor contained fluid, he opened it and dressed the interior with irritating ointments. In other tumors he di-

rects an explorative puncture, in order to ascertain the nature of the contents of its structure. Fatty and other solid tumors are to be cut out by a crucial incision, always being careful to remove the entire capsule. He gives drawings of various instruments, namely, scalpels, tenacula, and perforators, for dissecting out tumors (Ch. ii., 45, 46).

His description of aneurism, and its treatment by ligature above and below, and laying open and evacuating the sac, is much the same as that of Paulus Ægineta. It is remarkably lucid and indicates much skill and good sense.

The cure by compresses and tight bandages is also spoken of (vide Al-saharavius, Pract. xxix., 11).

Mr. Adams, to whom I am so much indebted in preparing this analysis of the surgical procedures of Albucasis (Commentary on the Seven Books of Paulus Ægineta), says, "no author, ancient or modern, has described the modes of performing venesection in all parts of the body more accurately than Albucasis. Bleeding from the jugular vein he describes in much the same way that it is now practiced by veterinary surgeons, namely, by placing a sort of scalpel, bent at the point, which he calls a fossorium, upon the vein, and striking the instrument with a hammer or some such body. He gives drawings of variously-shaped lancets for opening the veins of the arm (Chir. ii., 97).

He gives a minute description of the operation of arteriotomy, and the mode of ligating the vessels, which he advises in cases of inveterate hemicrania, catarrh, etc. (Chirurg. ii., 3).

Albucasis gives a most circumstantial and interesting account of the methods of cupping every part of the body. He particularly recommends cupping the nape of the neck in affections of the brain and eyes. He gives a full account of dry cupping. He advises it to be applied when the disease is seated in places which do not bear cupping with scarifications, such as the regions of the liver, or spleen, the

kidneys, the bowels, and the joints affected with gout. In applying the instrument he directs us either to create a flame in it, or to fill it with hot water. He gives drawings of various instruments for cupping (*Chir. ii.*, 98). He also treats fully of leeching, which, however, he advises only in cases in which the cupping instrument cannot be applied. When the bleeding continues longer than is desired, he directs a piece of cloth soaked in cold water to be applied to the place, or if this fails, styptics, such as galls, beans without their skins, and the like. When the leeches will not take, the place is to be smeared with fresh blood. When it is desired to make them drop off, powdered aloes, salts, or ashes are to be sprinkled on them (*ii.*, 99).

He gives directions for the removal of preternatural and supernumerary digits. When fingers are adherent to one another, he tells us to divide them with a scalpel, and keep them separated by a pledget moistened with oil of roses, or a thin plate of lead between them, until the healing is completed (*Chir. ii.*, 91).

In cases of empyema, cauteries were much used by the ancients. In some cases the hot iron was made to penetrate between the fifth and sixth ribs, into the chest, and thus evacuate the pus at once. Others used the knife for the same purpose. Albucasis gives a drawing of an instrument for perforating the chest expeditiously (*Chir. i.*, 26).

In treating of surgical operations for the removal of cancerous growths, Albucasis says that he never saw a case of cancer cured unless the tumor was small and recently formed. He directs us, when the operation of excision is attempted, to cut out the tumor by the roots, and if the hæmorrhage from any vessels be profuse, to arrest it by the cautery (*Chir. ii.*, 53).

In cases of abscess of the liver, Albucasis directs the pus to be evacuated with the red-hot iron, and gives a drawing of a spear-shaped cautery for this purpose (*ii.*, 30).

Albucasis speaks of paracentesis in cases of hydrocephalus internus in infancy, but adds that in every case it had proved fatal. He cautions against wounding the artery lest instant death should occur.

Paracentesis was resorted to by most of the ancients in cases of abdominal dropsy. The description of the operation, the instruments, and the place of incision as given by Albucasis is very minute. After the incision he tells us to introduce a canula made of silver, copper, or brass, having a small hole at the bottom and three at the sides. He advises the evacuation of not more than one-half of the fluid at first, the remainder subsequently, according to the strength of the patient. He says the opening readily contracts when the canula is removed (ii., 54).

In cases of abdominal wounds, and wounds of the intestine, Albucasis gives several modes of performing gastrography, and relates the history of a case in which he treated the wound by this operation (ii., 87).

Albucasis quotes quite literally from Paulus Ægineta, all that relates to hypospadias, to imperforate glans penis, phimosis, and adhesion of prepuce to the glans. He describes the operation of circumcision on boys as a rite of the Jewish religion. He directs the prepuce to be cut with a pair of scissors, and the part to be allowed to bleed freely. From the manner in which he expresses himself respecting the operation, there can be no doubt that Albucasis was a Jew, and Paulus Ægineta a Pagan (ii., 57).

Catheterism, and injection of the bladder, were well-recognized operations in Arabian surgery in mediæval times. Albucasis borrows his account chiefly from Paulus. The catheter recommended by Albucasis was made of silver. He gives a description and drawing of an instrument for throwing injections of oil and water into the bladder when inflamed or ulcerated. It is a tube of silver or copper having the bladder of a ram attached to it (Chir. ii., 59).

The operation of lithotomy, and all that relates to vesical calculi is carefully and well described by Albucasis. It cannot fail to be interesting to the modern surgeon to read the following account given by this ancient chirurgion of this very important operation.

Having cleared out the bowels with a clyster, the patient is to be shaken so as to make the stone descend, and he is then to be secured in the arms of an assistant, with his hands under his nates. The surgeon is then to press upon the perineum, and, if the stone be felt, the operation is to be proceeded with; but otherwise, the index finger of the left hand, if the patient be a child, and the middle if an adult, is to be introduced into the anus, and the stone is thereby to be gradually brought down to the neck of the bladder. Having pushed it outwards to the place where you mean to make your incision, an assistant is to be directed to press down the bladder from above the pubes, while another draws up the testicles with the one hand, and with the other stretches the skin under them. Then with a proper scalpel the operator is to make an incision between the anus and the testicles, not in the middle, but towards the left nates, straight upon the stone which is to be pressed out by the finger. Let the incision be transverse (oblique?), large externally, but internally the size of the stone. If the stone does not then start out, the operator must seize upon it with a forceps, or a hook having a lunated extremity. If there be more than one stone, the largest must be extracted first, and then the others may be easily removed. When the stone is large he directs us to break it down with a forceps. His directions respecting the after treatment are similar to those of Paulus. When a calculus sticks in the urethra, he tells us to cut down upon it. His description of lithotomy in the female is more minute and particular than that of any previous writer. Having pro-

cured a dextrous midwife, or some proper person to introduce her finger into the rectum or vagina, and press the stone down to the left hip, the operator is to make first a small incision over it, and afterwards, by the help of a sound or specillum, it is to be enlarged so as to allow a passage for the stone (*Chirurg. ii., 60, 61*).

All that is said above is little more than a repetition of what Celsus wrote on this subject in the first century. The ancient operation with scarcely any alterations will be found described in the works of nearly all of the earlier modern writers on surgery. See, Brunus (*Chirurg. Magna, ii., 17*), and Guido de Cauliaco (*Chir. vi., 2*). Brunus, however, preferred the strictly median incision.

In hydrocele, the treatment adopted by Albucasis consisted in making an incision in the swelling and dissecting out the tunica vaginalis of the testicles. The chief dressing was to fill the interior with wool soaked in oil; and applying externally wool dipped in warm oil and wine. In some cases the actual cautery was used instead of cutting out the tunica vaginalis. He adds, that if the patient be timid and do not choose to submit to these operations, the surgeon may let out the water either with a scalpel or the instrument used for tapping in dropsy. He states, however, that after this operation the water will collect again (*Chirurg. ii., 62*).

In castration, on account of tumor, or other morbid growth of the testicle, Albucasis directs us to separate the cremaster muscle from the blood vessels, to tie the vessels, and then remove the testicle from the surrounding parts. When the disease consists of a fleshy tumor which adheres to the testicle he directs us to cut it out, and save the organ. After the operation, the wound is to be filled with rose-oil and wine (*Chir. ii., 63*).

In ancient times the radical cure of hernia was not only

a serious but a most cruel operation. In strangulated hernia no operation was undertaken. In the operation for the radical cure of hernia, the testicle was always sacrificed, the vessels were ligated, a portion of the peritoneum removed, and antiseptic or air-excluding dressings of wool and rose-oil applied. This operation which was described by Paulus Ægineta, in the seventh century, was done much in the same manner by Albucasis, and continued to be practiced until within about two centuries of the present time. The operation, hazardous as it may appear to us, could not have been attended with great danger, otherwise it would not have been so frequently performed as it seems to have been, for, according to Fabricius ab Aquapendente, a celebrated specialist, known as a rupture doctor, of his time informed him that he used to operate upon two hundred patients at an average every year. Fabricius, however, disapproved of this operation, and would have it resorted to only in extreme cases, and to be content in general with supporting the parts with a truss.

Albucasis gives the following account of the operation: He says the disease is occasioned by the descent of a portion of intestine to the testicle, owing to rupture or distention of the peritoneum. Sometimes, he says, fæces get into the prolapsed bowels, and being retained give rise to violent and sometimes fatal symptoms. When going to operate he directs us, in the first place, to make the patient reduce the intestine if reducible. Then an incision is to be made along the whole skin of the testicle, and hooks are to be fixed in the lips of the wound so as to enlarge it and allow a passage for the testicle. The membranes, then, below the skin, are to be dissected, so as to expose completely the tunica vaginalis (*sifac album*). The index-finger is then to be introduced between the tunica vaginalis and the second coat (tunica albuginea?) so as to free the adhesions at the back

part of the testicle. The operator is afterwards to separate the testicle from all its adhesions and raise it up to the external wound. He must now examine whether any portion of intestine remains protruded, and if so it must be replaced. The operator is then to take a large needle armed with a cord of ten threads, and having introduced it behind the tunic under the skin of the testicle its extremities are to be cut, and the threads arranged into four pieces. With them the peritoneum is to be tightly bound in a crucial form, so that the nutrient vessels may not be able to reach it, which will obviate inflammation. Another ligature is to be applied afterwards at the distance of less than two fingers' breadth from the former. After applying these two ligatures, about a finger's breadth of the peritoneum is to be left, and the rest is then to be cut all around, and the testicle removed along with it. An incision is then to be made at the lower part so as to allow an outlet for the blood and matter. Wool dipped in oil is to be applied afterwards, and bound as formerly described. Sometimes, he adds, the cautery is applied to the tunica vaginalis after the incision for fear of hæmorrhage (*Chir. ii.*, 65). He minutely describes the treatment by burning in another place (*i.*, 47).

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ALBUCASIS gives the operation of extracting the dead foetus from the uterus, by embryotomy, in almost the same words as it is described by Paulus, which will be found in my sketch of this ancient Greek surgeon. Albucasis relates a case of extra-uterine pregnancy that came under

his own observation. A woman being pregnant, the foetus died without delivery, and subsequently an abscess formed at the navel, and coming to maturity, discharged, to his great surprise, not only pus but the bones of a foetus. The mother lived many years after this event, a fistulous opening always remaining from which a purulent discharge never ceased to flow. This is one of the earliest, if not the first case of the kind on record.

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The work of Albucasis contains drawings of the instruments used in his time for obstetrical operations. Among them are several forms of forceps, but as they all have teeth, it is to be presumed that they were used only for delivering the fœtus when dead. It is to be regretted that he has entirely omitted the forceps mentioned by Avicenna (*Chirurg. ii.*, 76 and 77). These rude and curious figures of obstetrical instruments are all copied in a rare book entitled *Gynæciorum, hoc est, De Mulierum tum alii, tum gravidarum, parientium et puerperarum affectibus, etc.*, 4°, *Basileæ*, 1566. This is a collection of works on the subject of obstetrics, made by Caspar Wolph. One of the books is extracted chiefly from Albucasis, the figures of twelve instruments, including a speculum uteri, several forceps, hooks, and cutting instruments, are to be found in Chapter 72.

Fistulæ are treated of by Albucasis at great length. He advises making free incisions, and the removal of pieces of diseased bone which chance to be found at the bottom of the sore. He relates a case of fistulous ulcer in the thigh, to cure which he removed large pieces of bone, sawing it down as far as the marrow. Some of his saws are of very ingenious construction, one of them being very like that known to us as Hey's saw. He enumerates nine specific causes which prevent the healing of wounds. Space will not permit me to repeat them.

In the treatment of hæmorrhoids Albucasis prefers excision and burning, but if the patient will not submit to these methods of cure, he then resorts to the ligature. Excision is done by seizing the pile with a hook and cutting it at its base, after which styptics are applied. He applied the ligature by transfixing the base of the hæmorrhoid with a needle armed with a thread (*Chir. ii.*, 81). He gives full directions for the use of the actual cautery (*p. i.*, 37).

In operating on an imperforate anus, our author advises,

after incision, the introduction of a leaden canula to prevent closure of the artificial opening.

Amputation of the extremities in cases of mortification was practiced in the days of Albucasis. When the disease is seated in the hand, he recommends us to amputate at the fore-arm ; when in the fore-arm, at the elbow ; and if the arm itself be affected, he considers the case to be hopeless. The same view is taken in regard to the lower extremities, all cases of mortification above the knee he pronounced incurable. In performing the operation, he directs us to apply two bandages around the limb, one above and the other below the point selected for the amputation. These bandages are to be pulled by two assistants ; the former upwards and the latter downwards, in order to put the skin upon the stretch ; the fleshy parts are then to be divided with a large scalpel down to the bone, which is then to be cut out or sawed across ; and, before this is done, a retractor of linen is to be applied around all the fleshy parts to prevent injury by the sawing. Should any hæmorrhage occur during the operation, he directs us to apply the cautery, or a styptic powder, and, after the operation, he has the limb properly bandaged until the stump is healed.

The imperfect state of surgery in his time, and the timid practice of our author, are illustrated by a case related by Albucasis. A person who had a spreading mortification in the foot, cut it off himself at the ankle-joint, and was cured for the time. The disease next attacked the hand, upon which he applied to Albucasis, requesting that he would cut it off in the same manner, but this he refused to do, for fear that the man's strength might not be able to endure the operation. He afterwards learned that the man had cut off his whole hand, and had recovered (*Chirurg. ii., 89*).

Albucasis gives a very full account of the modes of extracting various weapons. He also relates some interesting

cases of recovery from very severe wounds. An arrow entered at the root of a man's nose, and was extracted by Albucasis behind his ear; the man recovered without injury to the eye. He extracted another large arrow which had lodged deep below the eye of a Jew; and, in this case also, the sight was not impaired. He extracted a barbed arrow, which had lodged in the throat of a Christian, by enlarging the wound, and the man recovered. An arrow had lodged in a man's belly, so that, at first sight, Albucasis considered the case as hopeless; but, after thirty days, as no mortal symptoms had supervened, he enlarged the wound and extracted the weapon. He says he saw a man who got an arrow lodged in his back; the wound healed, but, after an interval of seven years, the weapon came out below his buttocks. He knew a woman who had an arrow lodged in her abdomen; the wound healed, the weapon never afterwards occasioned her any inconvenience. He also relates that he finally extracted an arrow, which had been buried in the nose of a prince, after making various fruitless attempts for the space of four months.

He gives many sensible directions for removing arrows which are driven into bone, for the use of the probe, the trephine, etc. He concludes with giving drawings of various forms of forceps, and instruments called impellents (*Chir. ii.*, 96).

There is nothing of special note in the works of Albucasis that is not to be found in Paulus Ægineta, and still more ancient authors, concerning fractures and dislocations of the bones. He says that fracture of a bone is recognized by the derangement of the broken pieces, by their projection, and the crepitus produced upon pressure. He remarks, however, that there may be a splitting or fissure, without displacement or crepitus. In fractures of the skull with depression, Albucasis resorted to the trephine. The drawings

which he gives of the surgical instruments used by the ancients in operations on the head are very interesting, and serve to illustrate the descriptions of Paulus and other earlier surgical writers.

In fractures of the clavicle, Albucasis enjoins the surgeon, when there are any projecting *spiculæ*, to make an incision and cut them out; after which, if the wound is large, unite it with sutures. A compress moistened with rose-oil, vinegar, and wine, is to be applied to allay inflammation. He understood the value of postural treatment in this fracture, and hence directs the patient to sleep on his back with a pillow under his arm-pit.

In cases of comminuted fracture of the ribs, our author advises making an incision and removing any pieces of bone which may irritate the pleura. He gives a drawing of the *meningophylax*, or instrument for protecting membranes during the sawing of bones.

In the treatment of fractures of the arm, Albucasis directs us to make the bandages of soft thin linen cloth; but of broader and firmer linen, if the thigh or leg is to be treated. Below them is to be applied a smooth cloth spread with a liniment. After the under bandages have been put on in the manner already described (which is the same as that of Paulus), the splints are to be applied, provided no swelling nor inflammation be present, for in that case they are to be deferred for a few days. These splints are to be constructed from the middle part of the *alcanna*, or of pine, or of the palm-tree, or of a tree which he calls *calingi*.

Avicenna directs us to form the splints of the wood of *alcanna*, or of oleander, or of pomegranate tree, or the like.

In the treatment of fractures of the ulna, and radius Albucasis is very lucid and accurate. He calls the ulna the larger of the bones. He directs the arms to be suspended

with the thumb uppermost. When fragments of bone are likely to occasion irritation, he advises making an incision and removing them. When the arm is affected by severe pruritus, he tells us to remove the dressings and bathe it with hot water.

The best interpretation of the language of Albucasis in describing the process of treating fracture of the thigh bone, is that he applied splints which extended the entire length of the limb. He says the surgeon must stuff up all the hollow places in the limb with soft pads before applying the splints. Also, that a bandage be applied from the heel to the nates. Rhazes is the only one among the ancients who directs the thigh to be placed in a bent position, with suitable supports beneath, in other words, the double-inclined plane.

When a redundant callus is formed as a result of union in fractures, if recent, Albucasis directs us to use astringents, such as aloes, olibanum, and myrrh, with wine and vinegar. He also speaks of applying a plate of lead to promote absorption by its pressure. When the callus is hard, he would have it scraped or sawed off.

In complete dislocation of the lower jaw Albucasis directs its reduction by introducing the thumbs into the mouth, and grasping the jaw in the manner described by Hippocrates.

Albucasis, as well as Rhazes, Avicenna, and Haly Abbas, believed that dislocations occur more frequently at the acromial than at the sternal end of the clavicle. Sir. Astley Cooper and Mr. Liston confirm this ancient opinion, in opposition to Desault and Boyer.

Albucasis describes four varieties of dislocation of the hip, and the methods of reduction. The latter are; First, by rotating the limb in all directions. (This would seem to imply reduction entirely by manipulation). Second, by

making extension and counter-extension, with the aid of two assistants. Third, by suspending the patient, and getting a strong assistant to grasp the affected leg, and swing himself by it. Fourth, by making extension with ropes fastened to two sticks or pieces of wood as in dislocation of the spine. When the dislocation is forwards, the surgeon is to press down the prominent part with his hands; but if backwards, a board is to be used as described by Paulus.

According to Albucasis, dislocation at the ankle can only take place inwards or outwards. When the tarsal bones are displaced, he directs us to restore them by making the patient put his foot upon the ground; and the surgeon by placing his foot upon it and standing erect is to push them into their place. After their reduction a splint is to be put under the sole, and secured with bandages.

This author has also treated of all the other varieties of fractures and luxations of the bones, but as no additional observations are to be found in his works, which are at all original, but merely such as are contained in the writings of still earlier surgeons, I will not repeat further what he has said upon the subject. In all cases he exhorts the surgeon to act with caution but confidently, assuring him that such conduct will prove most pleasing in the sight of his Creator, and redound to his own glory.

The works of Albucasis were held in very high estimation by the early modern writers on surgery, as we find him extensively quoted by Guy de Cauliac, Theodoricus, Brunus, Gulielmus de Saliceto, and others, down even to the time of Fabricius of Aquapendente.

The works of Albucasis and Alsharavius, if we are to consider them as one and the same author, have been printed and published, either complete or in part, in five and twenty editions. The earliest was at Venice in 1471, the latest at Oxford, England, in 1778. They have not

always been published separately. They have been published with Mesue, Horatianus, with Roland and Roger, and Constantine the African.

I have a fine folio copy with the following title: *Libri theorice necnon practice Alsaharavii, qui vulgo Acararius dicitur, Impensis Sigismundi Grim Medici, & Marci Vuirsung Augusti Vindellicorum. Anno virginiei partus. MD.XIX. Die vigesima quarta Martii.* It contains one hundred and fifty-nine folios (equals 320 pages), and five index leaves, double columns, marginal references, no catch-words, two large and very curious initial letters. I also have an old copy of a folio edition printed in Arabic; but being unable to decipher Arabic, I cannot say where or when it was published. It formerly belonged to Atkinson, the quaint old biographer, and contains his book-plate. The Oxford edition, two volumes, quarto, 1778, in Arabic and Latin, with figures of the surgical instruments, is considered the best. The figures are also to be found in some of the earlier editions, viz.: Venice, 1500, and Basil, 1541.

Liber Servitoris de Præparatione Simplicium Bulchasi Benaberazerin translatus à Simone Januensi, interprete Abram Judæo Tortuosiensi Lib. xxviii. Venet. 4°, 1471; ibid fol. 1479; fol. 1483; fol. 1484; fol. 1490; fol. 1495; fol. 1497; fol. 1502; fol. 1527; fol. 1538; fol. 1558; fol. 1561; fol. 1602.

Albucasæ chirurgi methodus medendi Lib. III. Venet. fol. 1500; ibid fol. 1506; fol. 1520; fol. 1530; fol. 1531; Argent. fol. 1532; Basil. fol. 1541; Oxonii, 4°, 1778. The titles vary somewhat in the different editions.

Alzaharavii compendium artis medicæ. Aug. Vind. fol. 1490; fol. 1530.

Libri theoricæ necnon practicæ Alzaharavii, qui vulgò Alzararius dicitur. Aug. Vind. fol. 1519. Roma fol. 1519.